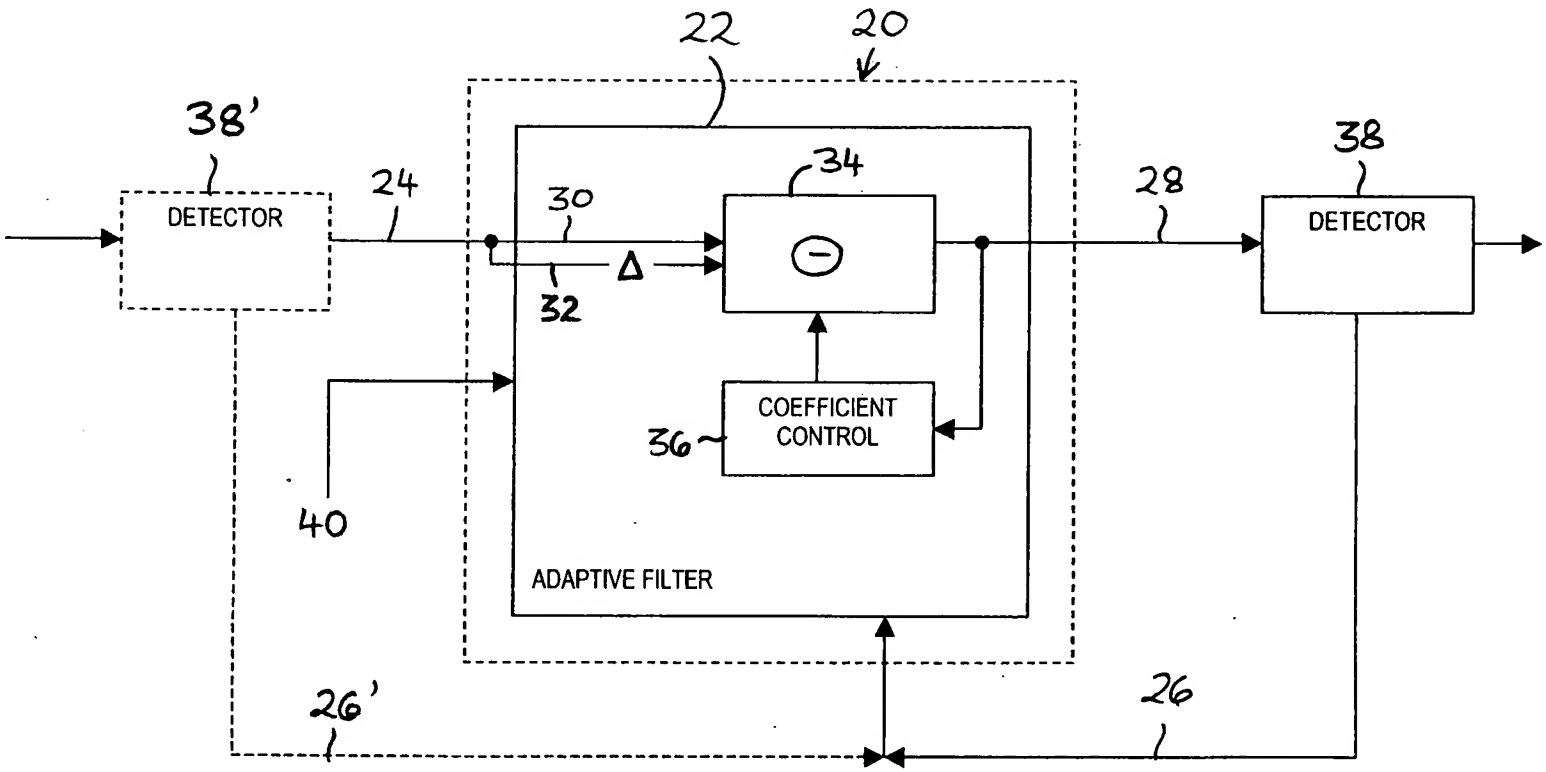

22
20
38'
DETECTOR
24
30
34
28
38
DETECTOR
32
Δ
COEFFICIENT
CONTROL
36
40
ADAPTIVE FILTER
26'
26

FIG. 1

Fig. 2(a)

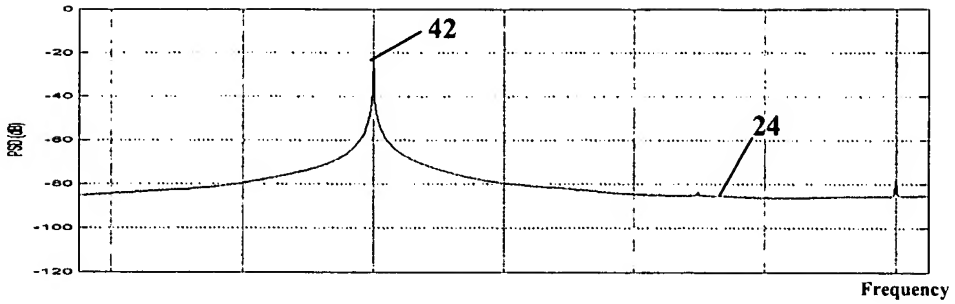


Fig. 2(b)

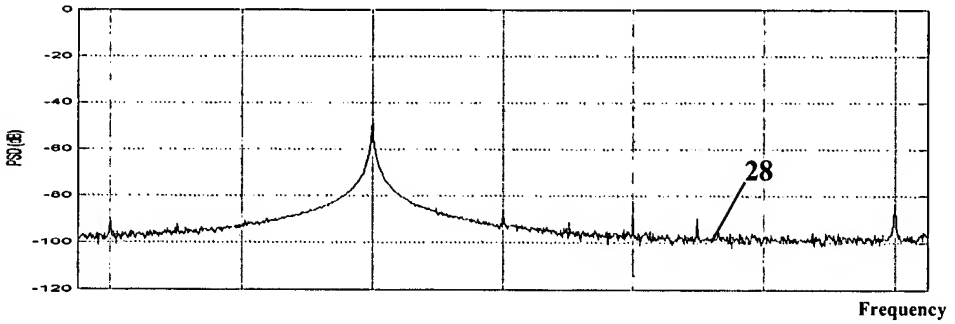


Fig. 2(c)

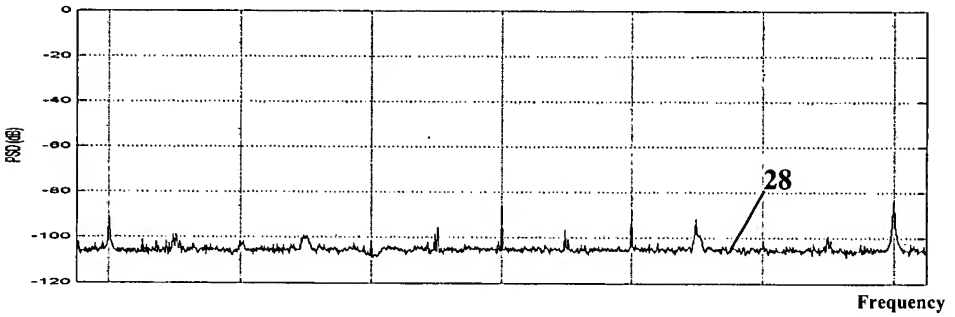


Fig. 2(d)

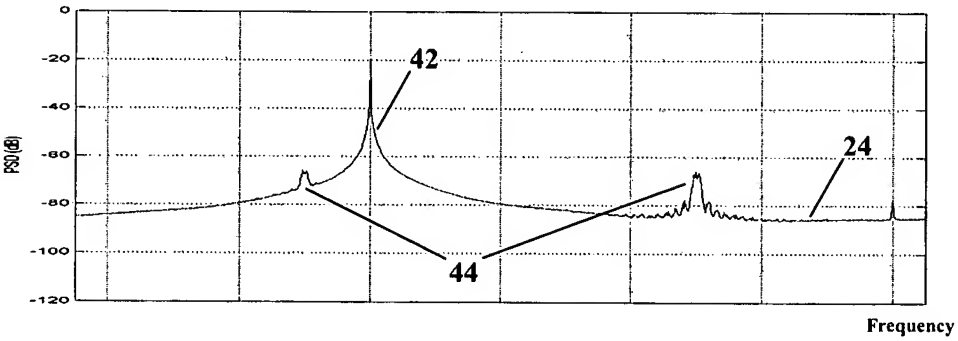
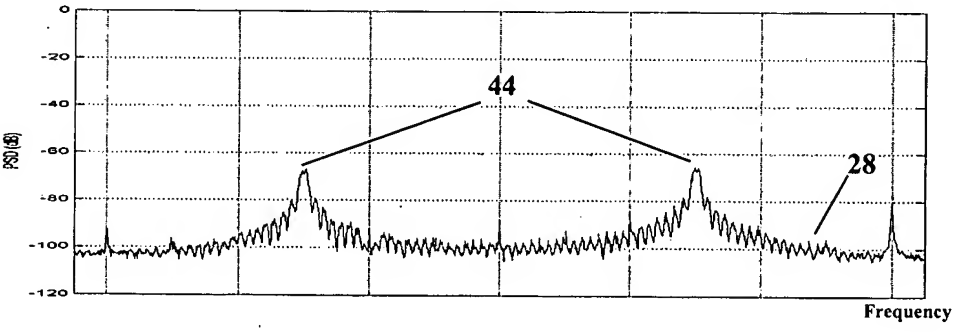


Fig. 2(e)



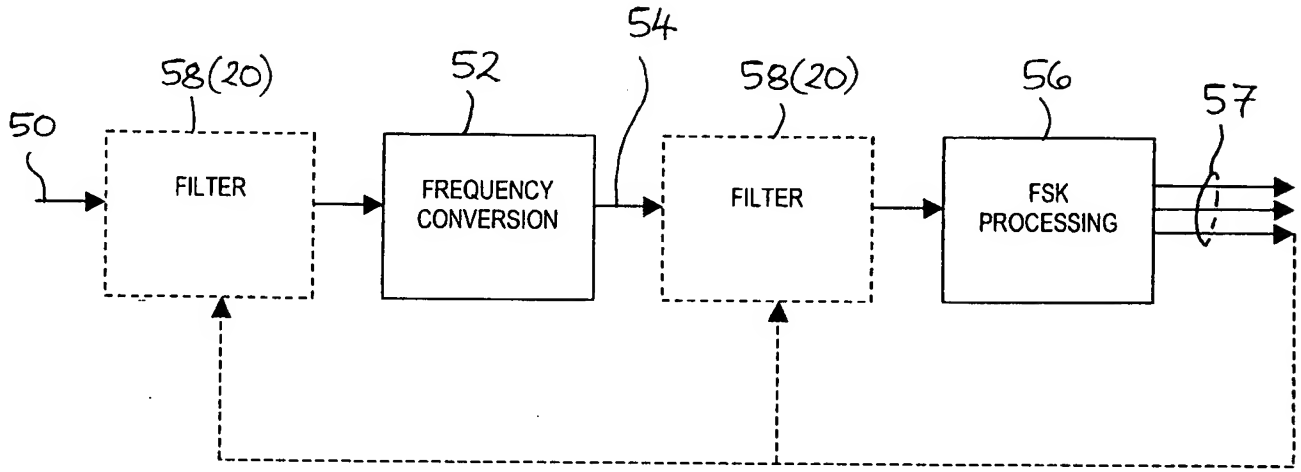

50
58(20)
FILTER
52
FREQUENCY CONVERSION
54
58(20)
FILTER
56
FSK PROCESSING
57

FIG. 3

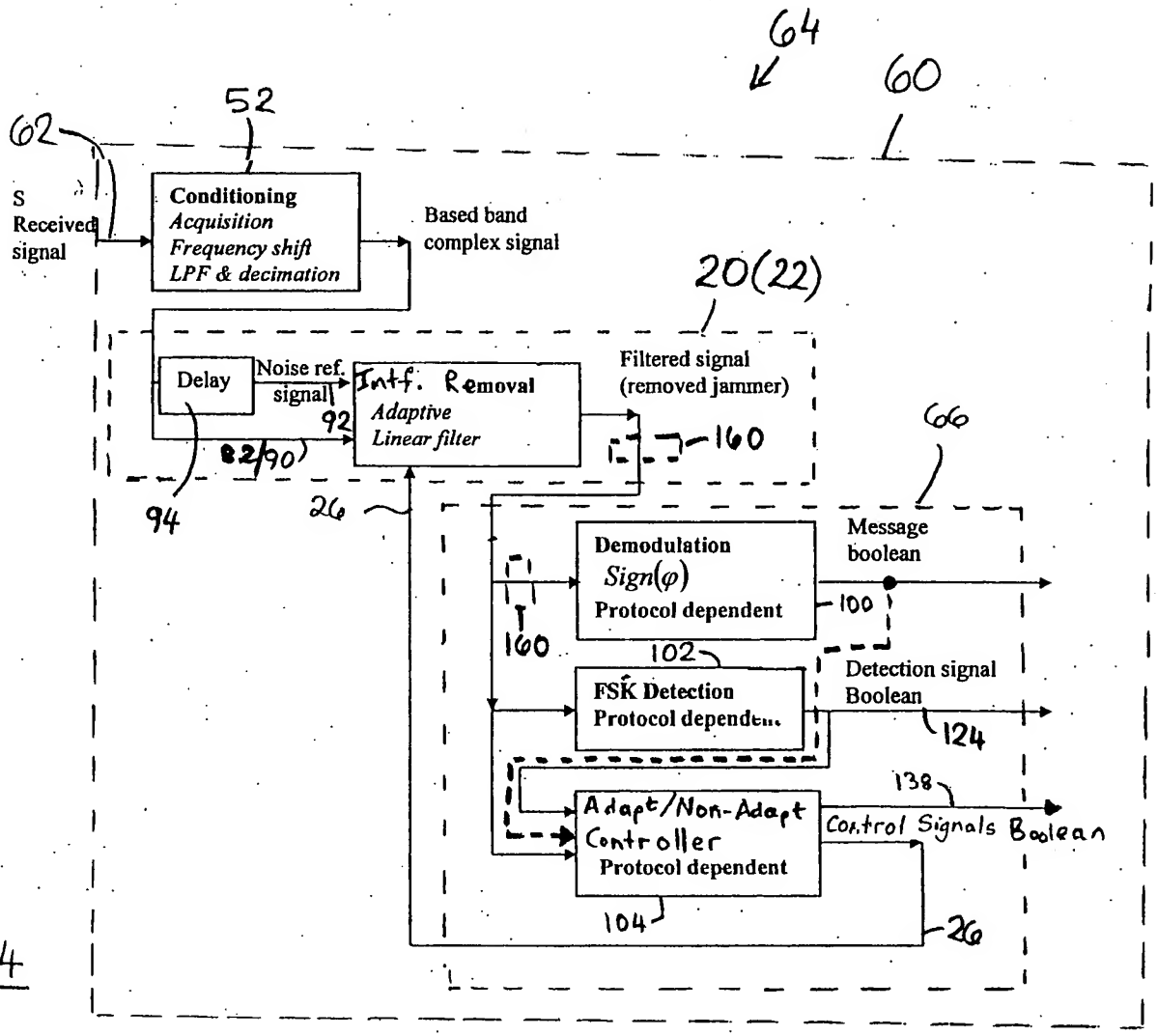

64
60
52
62
S
Received
signal
Conditioning
Acquisition
Frequency shift
LPF & decimation
Based band
complex signal
20(22)
Delay
Noise ref.
signal
92
Intf. Removal
Adaptive
Linear filter
Filtered signal
(removed jammer)
160
82/90
94
26
66
Demodulation
Sign(φ)
Protocol dependent
Message
boolean
100
160
102
FSK Detection
Protocol dependent
Detection signal
Boolean
124
138
Adapt/Non-Adapt
Controller
Protocol dependent
Control Signals Boolean
104
26

FIG. 4

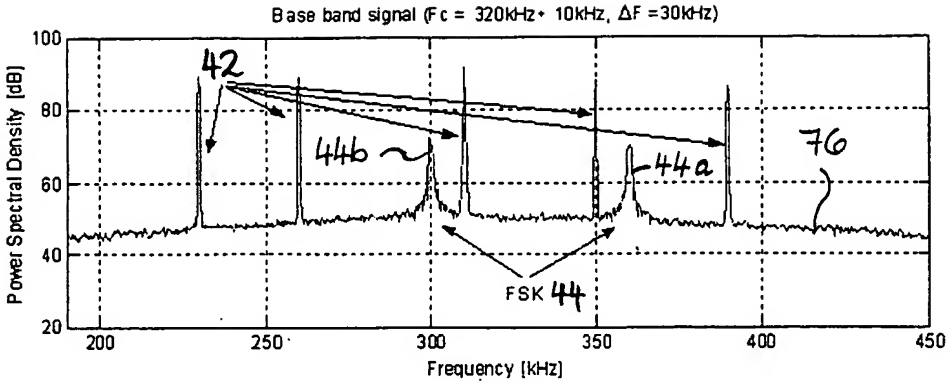


FIG. 5(a)

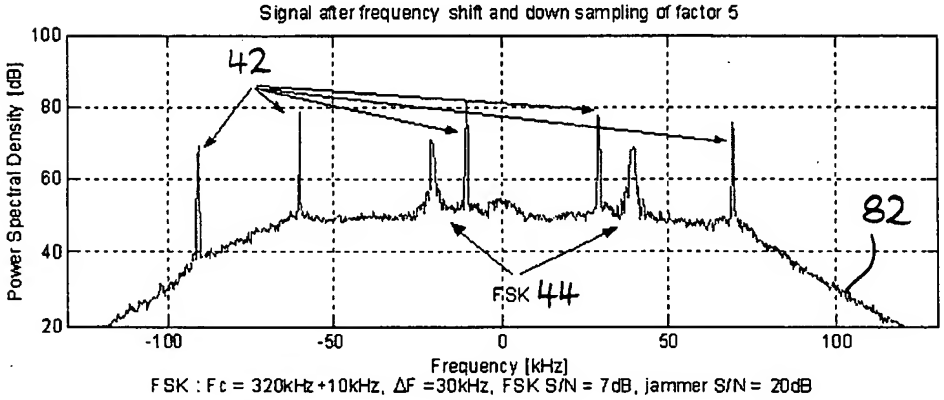


FIG. 5(b)

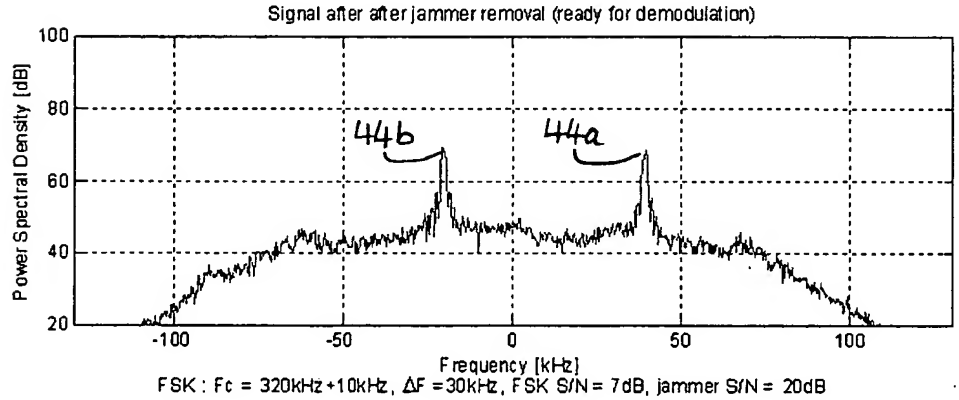


FIG. 5(c)

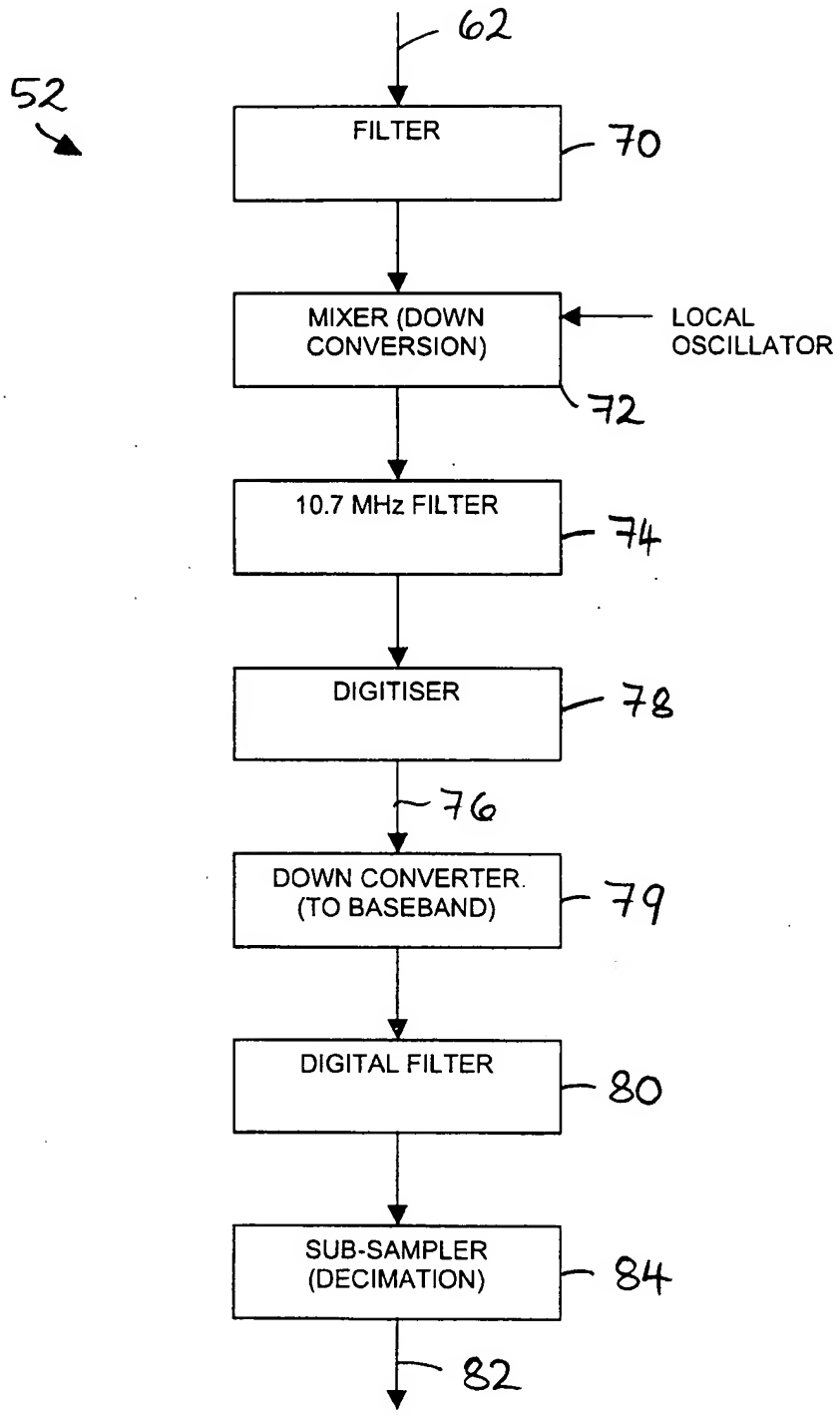

52
62
FILTER
70
MIXER (DOWN CONVERSION)
LOCAL OSCILLATOR
72
10.7 MHz FILTER
74
DIGITISER
78
76
DOWN CONVERTER. (TO BASEBAND)
79
DIGITAL FILTER
80
SUB-SAMPLER (DECIMATION)
84
82

FIG. 6

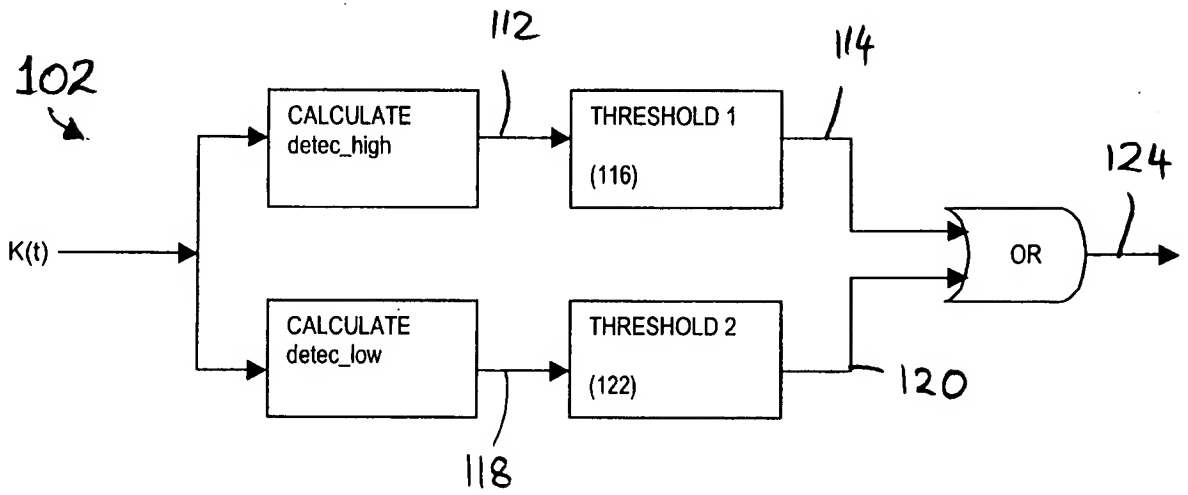

102
112
114
124
CALCULATE
detec_high
THRESHOLD 1
(116)
K(t)
OR
CALCULATE
detec_low
THRESHOLD 2
(122)
120
118

FIG. 7

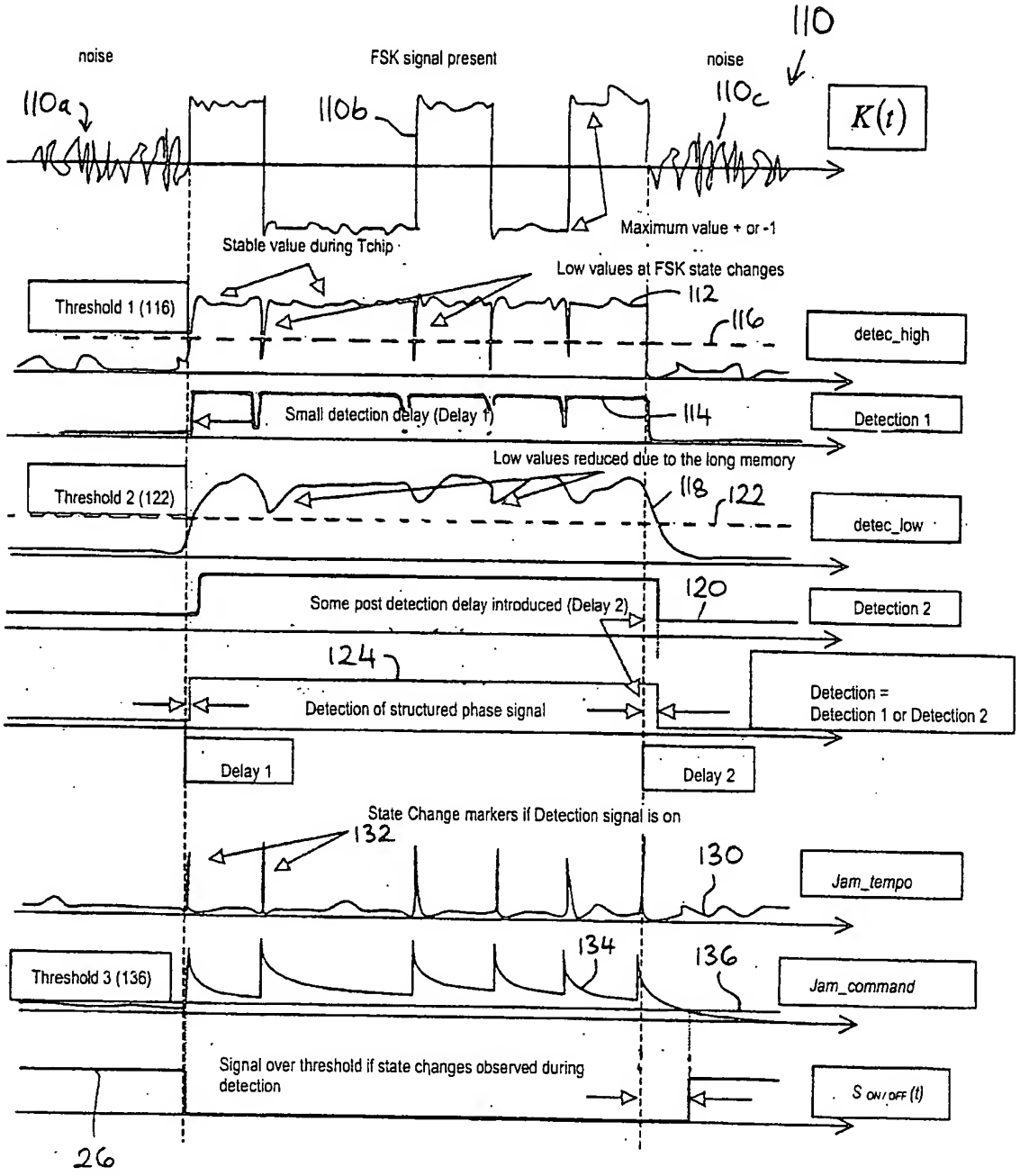

110
noise
FSK signal present
noise
110a
110b
110c
K(t)
Maximum value + or -1
Stable value during Tchip
Low values at FSK state changes
112
Threshold 1 (116)
116
detec_high
Small detection delay (Delay 1)
114
Detection 1
Low values reduced due to the long memory
Threshold 2 (122)
118
122
detec_low
Some post detection delay introduced (Delay 2)
120
Detection 2
124
Detection of structured phase signal
Detection =
Detection 1 or Detection 2
Delay 1
Delay 2
State Change markers if Detection signal is on
132
130
Jam_tempo
Threshold 3 (136)
134
136
Jam_command
Signal over threshold if state changes observed during detection
S ON/OFF (t)
26

FIG. 8

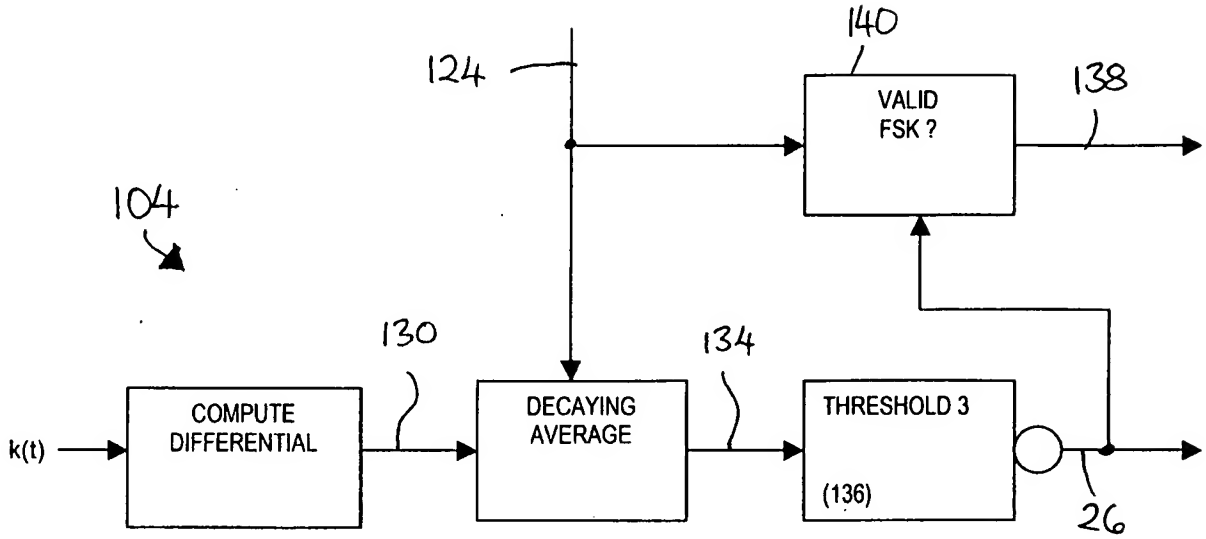

140
124
VALID
FSK ?
138
104
130
134
k(t)
COMPUTE
DIFFERENTIAL
DECAYING
AVERAGE
THRESHOLD 3
(136)
26

FIG. 9

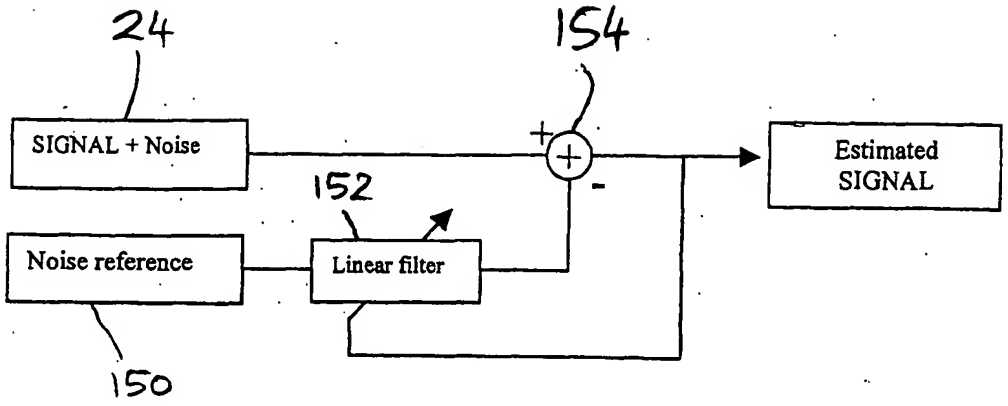

24
154
SIGNAL + Noise
+
-
Estimated
SIGNAL
152
Noise reference
Linear filter
150

FIG. 10

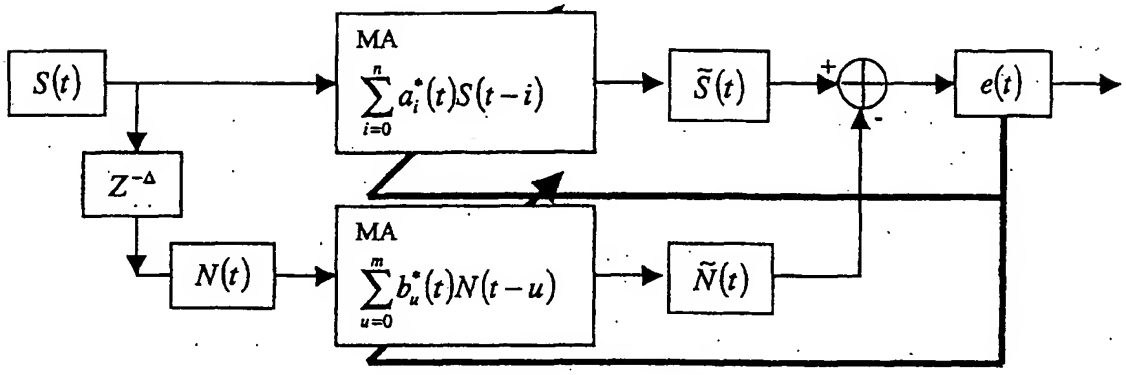

S(t)
MA
$\sum_{i=0}^{n} a_i^*(t)S(t-i)$
$\tilde{S}(t)$
+
-
e(t)
$Z^{-\Delta}$
N(t)
MA
$\sum_{u=0}^{m} b_u^*(t)N(t-u)$
$\tilde{N}(t)$

FIG. 11

$\tilde{N}(t)=\sum_{u=0}^{m} b_u^*(t) S_{CFD}(t-\Delta-u)=\bar{B}^T(t)\bar{N}(t)$	Filtering step
$\tilde{S}(t)=\sum_{i=0}^{n} a_i^*(t) S_{CFD}(t-i)=\bar{A}^T(t)\bar{S}(t)$	
$S_{CFDJ}(t)=\tilde{S}(t)-\tilde{N}(t)$	Jammer subtraction
$power(t+1)=power(t)+\mu_{power}\left(S_{CFD}(t+1)S_{CFD}^*(t+1)-power(t)\right)$	Signal power update
$\partial=\frac{\alpha}{power(t)} S_{ON/OFF}(t)$	Updating factor normalization and learning management
$\bar{B}(t+1)=\bar{B}(t)-\partial\bar{N}(t+1)e^*(t+1)$	Filter coefficients update
$\bar{A}(t+1)=\bar{A}(t)+\partial\bar{S}(t)e^*(t+1)$	
with	
$\bar{B}(t)=[b_0(t)\ b_1(t)\ ..b_m(t)]$ *colon vector*	
$\bar{A}(t)=[1\ a_1(t)\ ...a_m(t)]$ *colon vector*	
$\bar{S}(t)=[S_{CFD}(t)\ S_{CFD}(t-1)\ S_{CFD}(t-n)]$ *colon vector*	
$\bar{N}(t)=[S_{CFD}(t-\Delta)\ S_{CFD}(t-\Delta-1)\ S_{CFD}(t-\Delta-m)]$ *colon vector*	

FIG. 12

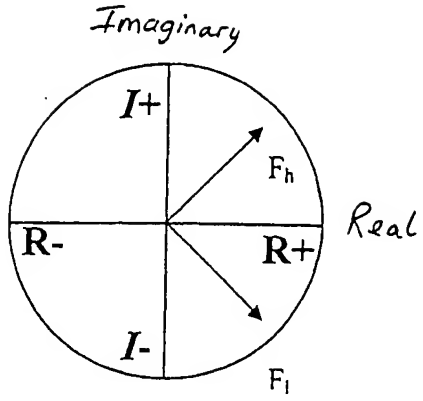


FIG13A

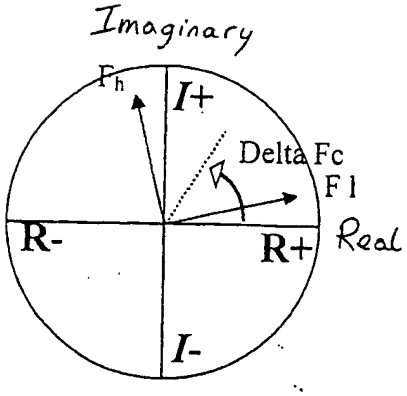


FIG13B

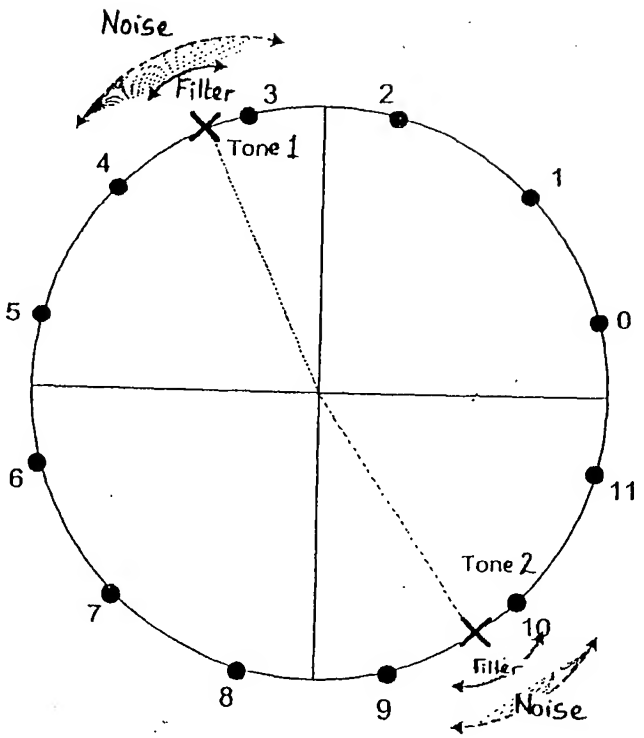


Figure 14A

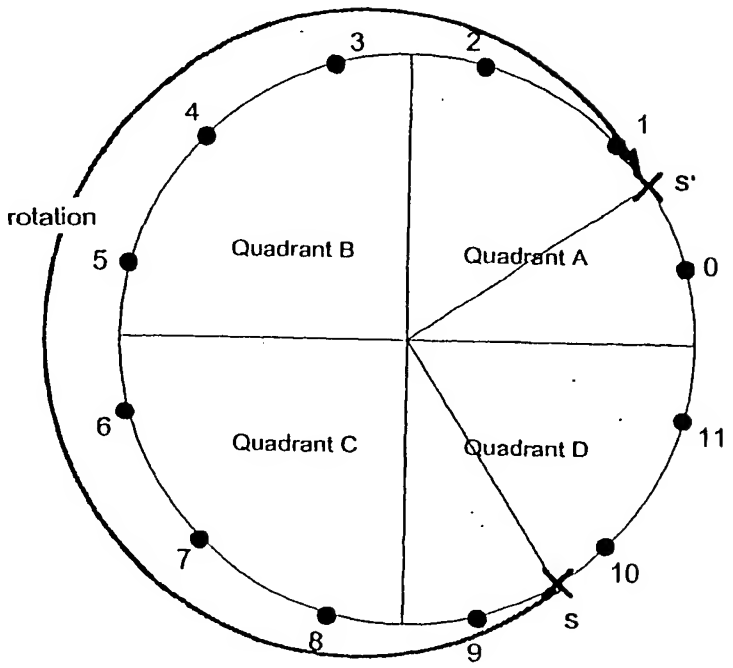


Figure 14B

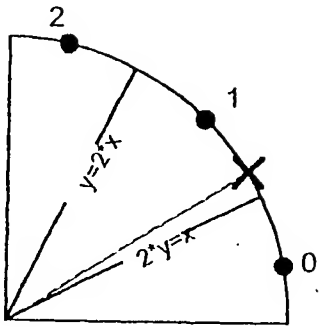


Figure 14C

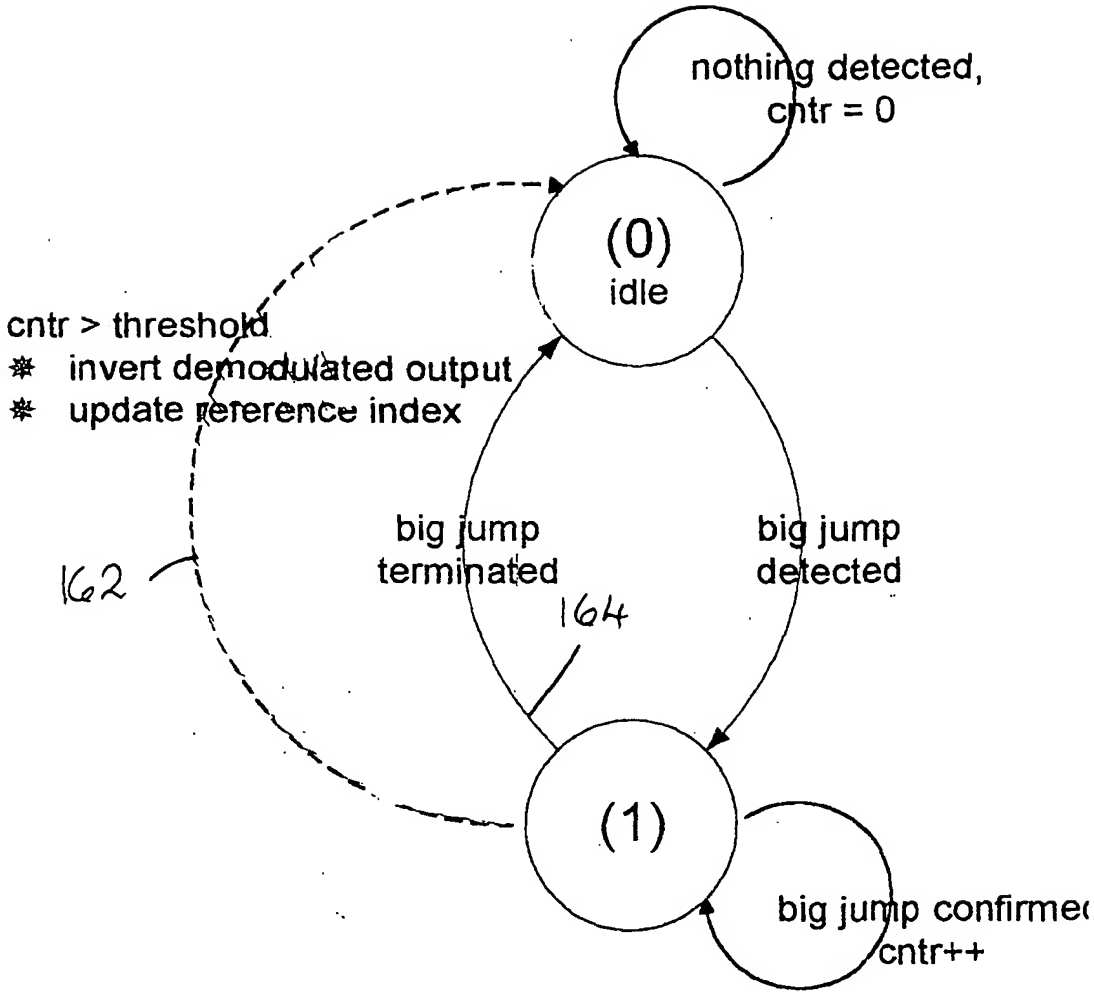

nothing detected,
cntr = 0
(0)
idle
cntr > threshold
* invert demodulated output
* update reference index
162
big jump
terminated
164
big jump
detected
(1)
big jump confirmed
cntr++

FIG. 15